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Job Performance Report

Project F-73-R-3

Subproject IV: RIVER AND STREAM INVESTIGATIONS

Study X: Middle, Fork Salmon River Fisheries Investigations

Period Covered: 1 April 1980 - 28 February 1981

by

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April, 1981

TABLE OF CONTENTS

Page

ABSTRACT 1

ACKNOWLEDGMENTS 3

INTRODUCTION 3

OBJECTIVES 3

RECOMMENDATIONS 6

TECHNIQUES USED 6

Survey of Steelhead Spawning Areas 6
Juvenile Transect Counts 6
Abundance and Distribution of Juveniles in Tributaries 6
Adult Steelhead Tagging 6
Main Salmon River Sport Fishery 7

FINDINGS 7

Survey of Steelhead Spawning Areas 7
Marble Creek 7
Loon Creek 8
Camas Creek 8
Big Creek 9
Juvenile Transect Counts 9
Abundance and Distribution of Juveniles in Tributaries 10
Adult Steel head Tagging 15
Main Salmon River Sport Fishery 15
Adult Steelhead Length Frequencies 23

DISCUSSION 23

LITERATURE CITED 24

LIST OF TABLES

Table 1. Summary of juvenile steelhead counts made in 20 transects at 8 km (5 mi) intervals from Boundary Creek to the mouth of the Middle Fork Salmon River, July 1980 (river level 2.85 on Middle Fork Lodge gauge) 11

Table 2. Number and species of trout caught in approximately 6.4 km (4 mi) increments down Marble Creek, August 1980 13

LIST OF TABLES (Continued)

Page

Table 3. Length frequencies of 98 rainbow trout caught in Marble Creek, August 1980 13

Table 4. Length frequencies of 74 cutthroat trout caught in Marble Creek, August 1980 14

Table 5. Description of wild steel head tagged in the main Salmon River below the Middle Fork, fall 1980 17

Table 6. Description of wild steel head tagged in the Middle Fork Salmon River, fall 1980 18

Table 7. Estimated Salmon River section 4 fish-year harvest of steelhead from questionnaire survey, check station count and comparative percent of harvest observed at the North Fork check station 1971-78 19

Table 8. Length frequencies of wild steelhead trout caught in section 4 (South Fork to Middle Fork) of the main Salmon River, fall 1980-spring 1981 22

LIST OF FIGURES

Figure 1. Map of Idaho showing general location of the Salmon River, Middle Fork and South Fork Salmon 4

Figure 2. Map of the Salmon River drainage showing major tributary streams, study streams, and harvest questionnaire sections 5

Figure 3. Map of Marble Creek showing tributary streams used as landmarks during survey in August 1980 12

Figure 4. Wild steelhead were jaw tagged in the Middle Fork and main Salmon Rivers, fall 1980 16

APPENDICES

Appendix I. Description of main stem Middle Fork snorkel transects. Photos on file at Idaho Fish and Game, Salmon Subregional Office 27

Appendix II. Summary of wild steelhead ratio data collected at the North Fork check station, Short Bar and from jet boat interviews on the Salmon River, fall 1980 and spring 1981 29

Appendix III. Length frequencies of juvenile steelhead - rainbow trout caught by angling on the Middle Fork Salmon River, August 1980 30

JOB PERFORMANCE REPORT

State of: Idaho _____ Name: RIVER AND STREAM INVESTIGATIONS

Project: F-73-R-3 Title: Middle Fork Salmon River Fisheries

Subproject: ___IV _____ Investigations

Study: X

Period Covered: 1 April 1980 - 28 February 1981

ABSTRACT

Adult steelhead spawner observations were conducted in April - May 1980, on four major tributaries of the Middle Fork Salmon River. Water conditions were marginal for viewing and angling and only one steel head was caught (on Marble Creek). Observations on spawning area locations were made.

Snorkel transect areas were established and counts of juvenile steelhead were made in twenty locations throughout the length of the Middle Fork in July 1980. Densities ranged from 0 to 5.4 fish per 100 linear meters.

In August the upper end of Marble Creek contained mostly cutthroat with rainbow-steel head predominating in the lower end of the stream.

Out of eleven adult steelhead tagged in the lower Middle Fork in the fall of 1980, three (27%) were subsequently caught by sport anglers in the main Salmon River the following spring.

Preliminary estimates indicate that 3,000 wild steel head destined for the Middle Fork were intercepted in the Salmon River sport fishery during the fall 1980 - spring 1981 season. Indications are that a 40% exploitation rate may be occurring.

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ACKNOWLEDGMENTS

All field work accomplished on this project in 1980 was by volunteer help; no permanent personnel were assigned to the project. The author and Russ Thurow conducted the snorkel transect counts in 1980. The following other persons contributed in a significant manner to the program: Don Anderson, Mark Ambruster, Kent Ball, Brian Gard, Jack Griffith, Russ Kozacek, Bruce May, Virgil Moore, John Nagle, Herb Pollard, Will Reid, Wayne Somes and Butch Welch.

INTRODUCTION

Wild steelhead runs into Idaho have shown a declining trend over the last decade. Losses of both juveniles and adults at Snake and Columbia River dams are the primary cause, but habitat loss and increased fishing pressure, including sport, commercial and tribal are significant impacts.

This decline in wild anadromous fish has illuminated their value and importance and has pointed to the need for assessing the remaining stocks to provide information for future management directions.

The Middle Fork Salmon River (Fig. 1, 2) is one of two major rivers in Idaho that remain in a basically pristine wilderness state and support wild steelhead runs; now diminished from historic levels. Continually increasing public pressure and desire for recreational sport fishing has resulted in appeals from anglers to provide steelhead fishing in the Middle Fork, which due to the declining runs, has been closed to fishing since 1974 for that species. The suggestions range from allowing catch-and-release fishing to establishing a hatchery supported run.

The Middle Fork project was initiated to obtain basic resource data on these wild steelhead runs to aid in future management decisions. Biological information collected on cutthroat trout during the study will also be reported.

OBJECTIVES

To assess the movement, distribution, relative abundance, origin (hatchery or wild) and other biological and behavioral characteristics of steelhead trout (adult and juvenile) in the Middle Fork Salmon River and tributaries.

To define principal steelhead spawning and rearing areas in the system.

To genetically type steel head from Middle Fork tributaries in order to compare them to each other and to other Idaho steelhead stocks and establish baseline data for assessing any future programs that may alter the genetic characteristics of the population.

To monitor the contribution of Middle Fork adult steelhead to the sport fishery in the main Salmon River canyon below that stream to derive estimates of harvest and escapement.

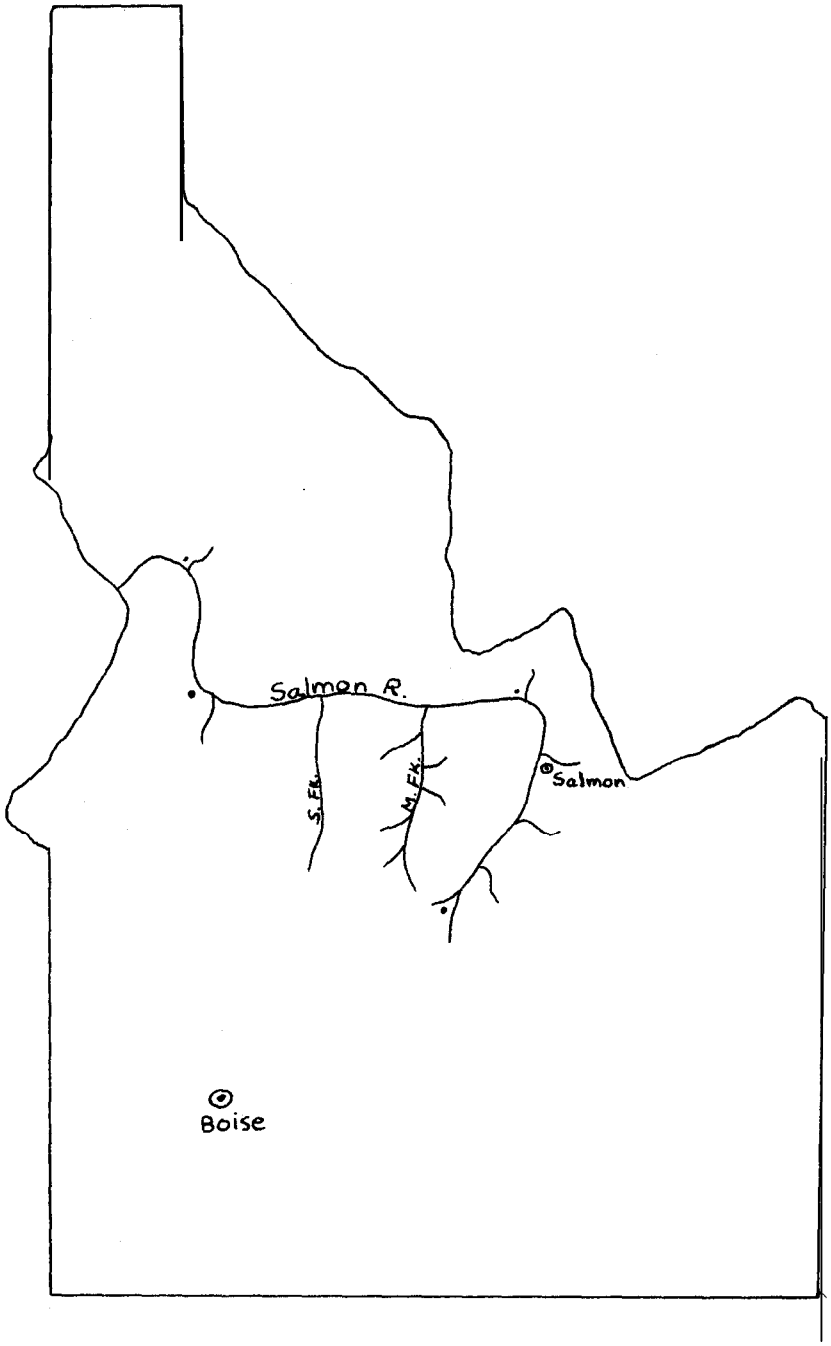
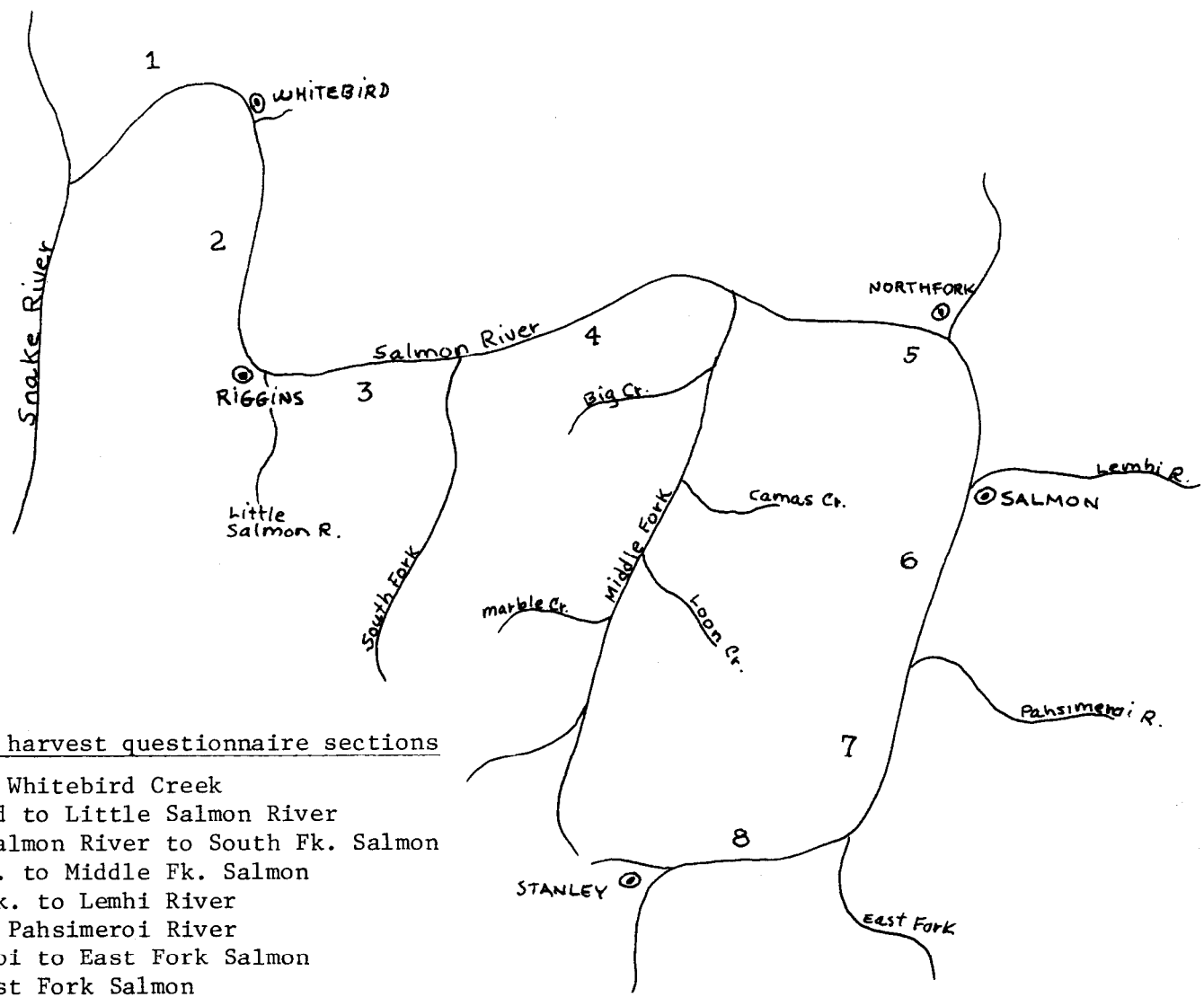


Figure 1. Map of Idaho showing general location of the Salmon River, Middle Fork and South Fork Salmon.



Salmon River harvest questionnaire sections

1 - mouth to Whitebird Creek
2 - Whitebird to Little Salmon River
3 - Little Salmon River to South Fk. Salmon
4 - South Fk. to Middle Fk. Salmon
5 - Middle Fk. to Lemhi River
6 - Lemhi to Pahsimeroi River
7 - Pahsimeroi to East Fork Salmon
8 - Above East Fork Salmon

Figure 2. Map of the Salmon River drainage showing major tributary streams, study streams, and harvest questionnaire sections.

RECOMMENDATIONS

Annual springtime observations for adult spawners should be concentrated on fewer tributaries at more frequent intervals to determine arrival, spawning and departure times more accurately.

Assessment of main Salmon River tributary streams between the South Fork and the Middle Fork should be investigated to help assess their contribution of wild steel head to that area.

TECHNIQUES USED

Survey of Steelhead Spawning Areas

Between 23 April and 2 May 1980, visual observation and sample fishing for adult steelhead spawners was conducted on sections of four major tributaries of the Middle Fork: Camas, Loon, Marble and Big Creeks. Four teams of two men each spent from 5 to 10 days traveling along sections of the tributaries on foot and horseback, looking and fishing for adult steelhead spawners. Observations on location and quantity of suitable spawning areas were recorded. Measurements and biological data were taken on fish caught.

Juvenile Transect Counts

Between 22 and 29 July we established a series of 20 transects along the 160-km (100-mi) stretch of Middle Fork from Boundary Creek to the mouth. Counts of juvenile steel head were made approximately every 8 km (5 mi) by two men floating through each transect using wetsuits, masks and snorkels. In some instances one man made two separate runs, one through each transect line (e.g. right and center) in lieu of one 2-man count or in addition. Those cases are indicated and the highest counts are presented if there was a difference. Transect counts commenced at river level 2.85 on the Middle Fork Lodge gauge. The steelhead were recorded as either Age I, II, or III fish as defined by size. Other species present were also noted.

The physical description, landmarks, location and length of each transect was recorded and photographs taken.

Abundance and Distribution of Juveniles in Tributaries

During 1980, one tributary of the Middle Fork (Marble Creek) was surveyed for most of its length, 40 km (25 mi), to assess the abundance and relative distribution of juvenile steelhead and other species. A two-man team backpacked the length of the stream making visual observations and angling. Lengths, species, numbers and locations of fish caught were recorded as were observations on areas of spawning gravel and side tributaries.

Adult Steel head Tagging

During the fall of 1980, volunteer personnel working on the project caught, jaw tagged and released adult steelhead trout in both the lower Middle Fork and the main Salmon River downstream from the Middle Fork. Although the emphasis was on measuring and tagging wild stocks, some hatchery fish were also jaw tagged.

We looked for tagged fish caught by anglers at a check station and in the

fishery and solicited voluntary angler returns. We also looked for previously tagged adults on subsequent tagging efforts.

Main Salmon River Sport Fishery

During the fall of 1980 and the spring of 1981, we monitored the steelhead sport fishery on the upper Salmon River above and below the Middle Fork. A check station was operated every Saturday and Sunday during the season when water conditions allowed angling. The station was located near the town of North Fork and operated from noon to dark and checked anglers returning from steel head fishing downstream from the station.

We also used a jet boat to monitor the commercial and private steelhead jet boat fishery occurring in the main Salmon River canyon below the end of the road (approximately 70 km [44 mi] below North Fork and 11 km [7 mi] below the confluence of the main Salmon and Middle Fork). A major fishing impact on the Middle Fork stock occurs in this area.

We collected information on numbers of anglers, hours spent fishing, fish caught, location of catch, length and sex data on the fish, fish origin (wild or hatchery) and checked fish for marks and/or tags.

FINDINGS

Survey of Steelhead Spawning Areas

Successful field observations of spawning adult steelhead is related directly to water conditions. Spawning activity usually coincides with spring runoff and often conditions are not conducive to observing spawners. During favorable water stages fishing success can be high and adult steel head and redds can be seen and provide valuable information on the location and timing of steelhead spawners. Changes in water conditions are directly related to weather conditions and can change from good to poor in a days time.

During the spring 1980 survey, tributary water levels were on a rising trend. Upper area conditions were favorable for viewing spawners and in most cases fishable. A warming trend and rain brought streams up during the latter part of the surveys and increasing velocities, water volume and turbidity prevented satisfactory observations and sampling toward the latter part of the surveys and on lower stretches of the survey streams.

Four tributaries were surveyed in the spring of 1980.

Marble Creek

Marble Creek enters the Middle Fork Salmon from the west approximately 101 km (63 mi) upstream from the mouth. It is approximately 40 km (25 mi) long. Average annual discharge is around 125 cfs (Gebhards 1959).

Between 25 and 28 April, two men surveyed Marble Creek from its mouth upstream approximately 18 km (11 mi) to Hogback Creek, angling and looking for the presence of adult steelhead spawners.

During this period, Marble Creek was rising and becoming increasingly turbid. No adult steel head were visually sighted in the stream and only one adult steel head was caught.

This wild male steel head, 81 cm (32 in), was caught approximately 9.5 km (6 mi) upstream from the mouth.

Spawning substrate is available in Marble Creek for its entire length. It is a moderate gradient stream with pools scarce in some areas. Both chinook salmon and steelhead utilize the stream for spawning and rearing. There are no barriers or obstacles at present in Marble Creek that would interfere with upstream migration of adults. The presence of large numbers of juvenile steelhead indicate substantialsteelhead spawning exists, but water conditions during the spring 1980 survey period precluded observations or successful angling for adults.

Loon Creek

Loon Creek is a major tributary of the Middle Fork and enters it 72 km (45 mi) above the mouth. It is about 55 km (34 mi) in length and has an average annual discharge of 495 cfs (Gebhards 1959). It is a moderate to steep gradient stream except for a 9.5 km (6 mi) section between Falconberry Ranch and Warm Springs Creek.

During the week of 28 April to 2 May 1980, two men inspected the Loon Creek drainage from Cottonwood Creek to the mouth, approximately 29 km (18 mi). While water conditions in Loon Creek were marginal for viewing fish or redds, the area from Falconberry Ranch upstream was clear enough to see the bottom in riffle areas. The Falconberry area has what appears to be the greatest abundance of suitable anadromous fish spawning habitat on Loon Creek and is the primary spawning area for chinook salmon utilizing that stream. Gebhards (1959) estimated that over 70% of anadromous fish spawning in Loon Creek occurs in this area. During 2 days of observing and angling in Loon Creek between Falconberry and Cottonwood Creek, 11 km (7 mi), no adult steel head were caught or seen.

Approximately 6.5 km (4 mi) of Cabin Creek was also inspected (to Bridge Creek). Cabin Creek enters Loon Creek just upstream from Falconberry Ranch and is one of its larger tributaries. Suitable spawning habitat was observed throughout this section but no steel head were seen or caught.

Inspection of Loon Creek from Falconberry Ranch to the mouth, 18 km (11 mi), on 30 April to 2 May, revealed no fish or redds. No steel head were caught in approximately 10 hours of angling effort. During that period Loon Creek was rising and becoming increasingly turbid and visibility was poor. High flows made angling difficult.

Camas Creek

Camas Creek enters the Middle Fork Salmon from the west, 56 km (35 mi) above the mouth. It is a major tributary averaging 200 cfs annual flow (Gebhards 1959) and has supported substantial chinook salmon spawning runs prior to the recent decline of that species. Areas of suitable spawning substrate lie predominantly in the area from Hammer Creek to the South Fork Camas, 29 km (18 mi). The lower mile of the South Fork also contains good spawning habitat. Major tributaries of Camas Creek such as Castle Creek, Yellowjacket Creek and the West Fork may also have substantial spawning and rearing capacity for anadromous fish.

Between 24 and 28 April 1980, two men surveyed Camas Creek from the mine above Hammer Creek to the South Fork and up the South Fork approximately 1.6 km (1 mi).

During this period heavy rain increased the flow and turbidity of Camas Creek making visibility poor. On 25 April, inspection of spawning areas in the lower 1.6 km (1 mi) of the South Fork Camas revealed no redds or fish. Visibility was good in that area. No fish were caught in Camas Creek in 3 days of angling.

On 26 April, the West Fork of Camas was surveyed for 5.6 km (3.5 mi) upstream from the mouth. We saw numerous gravel riffle areas which appeared suitable for steelhead spawning but no spawners were observed. The stream was not fished during the survey.

Big Creek

Big Creek enters the Middle Fork Salmon, 29 km (18 mi) above the mouth. It is the largest tributary of the Middle Fork, is over 80 km (50 mi) in length and averaged approximately 500 cfs discharge (Gebhards 1959). One of its tributaries, Monumental Creek, is also a major stream. Big Creek is known to support, or has supported in past years, substantial chinook salmon and steelhead runs. Salmon redd counts have been conducted annually since the mid-1950's in the upper area, but relatively little is known about the steelhead utilizing the stream.

Between 26 April and 3 May, two men backpacked down Big Creek from the Big Creek'Ranger Station to the mouth, approximately 69 km (43 mi), angling in Big Creek and looking for adult steelhead spawners. Conditions on the upper 19-24 km (12-15 mi) of the stream were good for observation and angling but no steelhead were seen. By day four (30 April) water visibility deteriorated due to heavy rains but angling conditions remained fair. During 8 days of observation and sample fishing the length of Big Creek, no steelhead were seen or caught.

Reconnaissance indicated that suitable spawning substrate and gradient is available for most of the length of the stream except for the last 14 km (9 mi) from the Taylor Ranch to the mouth where Big Creek enters a steep-walled canyon. From this point to the mouth the gradient increases with many rapids, cascades and large boulders and rubble.

What appears to be the most suitable spawning area occurs roughly 1.2 km (3/4 mi) above and .2 km (1/8 mi) below the mouth of Cabin Creek, approximately 29 km (18 mi) upstream from the mouth. The area upstream from the Big Creek Ranger Station to approximately Jacobs Ladder Creek supports most of the known chinook salmon spawning and may also support steelhead spawning.

Juvenile Transect Counts

The numbers of juvenile steelhead counted per transect in the Middle Fork ranged from 0 to 8 fish (Table 1). Based on length frequencies of juvenile steel head measured on the Middle Fork (Appendix III) and from much accumulated data from work done on Salmon River streams and the Middle Fork in past years, we classified fish to approximately 120 mm (4.5 in) as Age I fish, above 120 mm to approximately 170 mm (6.5 in) as Age II, and larger rainbow as Age III. Although we classified all rainbow as "steelhead" it is possible that nonadromous "resident rainbow" could be included in the counts.

Density of steelhead expressed as number of fish per 100 linear meters ranged from 0 to 5.4 (Table 1), and averaged 2.2. No discernable density differences between upper, middle or lower transects was evident.

Brief snorkel observations made in the lower ends of some Middle Fork tributaries during the 1980 counts (Marble, Camas, Wilson, Loon and Big Creeks) indicated higher juvenile steel head densities in those areas than in the river. Further work will be done on tributary densities in future project years.

We believe that snorkel counts on the Middle Fork should be conducted at or near the same river flows each year rather than relating the counts to the time of year (days of the month). The size of the Middle Fork precludes counting all fish in a stretch of river and the transects include generally one side of the river only. Because of this, river level or volume could have a profound influence on depth, velocity and cover within transects. Also, because only a portion of the river can be viewed, relating counts to linear meters appears to be more applicable than relating them to square meters of river surface area. This will also allow comparisons with other work being conducted on a similar Idaho river (Selway) in the future. Lindland (1979) reported a range of 0 to 116 steel head per transect on the Selway River between 1973 and 1978, but did not record the lengths of the transects. Measurements will be made in future years for comparison.

Abundance and Distribution of Juveniles in Tributaries

Between 18 and 23 August, we backpacked down Marble Creek from its headwaters to the mouth, approximately 40 km (25 mi), visually surveying the stream and angling (Fig. 3). We caught 197 trout which included 87 cutthroat, 98 rainbow and 12 Dolly Varden.

We also saw six adult chinook salmon and counted four redds between Dynamite Creek (approximately 32 km [20 mi] upstream from the mouth of Marble Creek) and the gorge below Canyon Creek (approximately 11 km [7 mi] up).

Cutthroat trout predominated in the upper stretches of Marble Creek and rainbow trout in the lower areas (Table 2). The rainbow were in two general categories: fish up to about 175 mm (7 in) that had the general appearance of juvenile steelhead (light coloration, slim body configuration), and fish in the 175-300 mm (7-12 in) range that appeared to be resident rainbow (dark coloration, full bodied) (Table 3). Of the 98 rainbow inspected, 76% (74 fish) were classified as juvenile steel head and 24% (24 fish) as resident rainbow.

Approximately 20 of the larger rainbow were killed and inspected and all were male fish with fully developed gonads, indicating that these are probably residual precocial steelhead. Electrophoretic analyses in future years may define this. While both cutthroat and Dolly Varden trout in excess of 300 mm (12 in) were caught the length of Marble Creek (Table 4), no rainbow exceeding that size were caught, which may relate to the phenomenon that precocial steel head do not normally live more than one summer after becoming sexually mature.

The majority of the cutthroat trout caught in Marble Creek were juveniles. Nearly 70% were less than 225 mm (9 in) in length (Table 4). Numerous fry were observed also. Mallet (1963) found that most cutthroat do not enter the main stem Middle Fork until Age III (} 245 mm), and reasoned that the tributary streams function as nursery and rearing areas for the younger age classes.

Table 1. Summary of juvenile steelhead counts made in 20 transects at 8 km (5 mi) intervals from Boundary Creek to the mouth of the Middle Fork Salmon River, July 1980 (river level 2.85 on Middle Fork Lodge gauge).

Date	Transect number	Transect length (m)	Steelhead juvenile counted Age I	Age II	Age III	Total	Steelhead per 100 m	River temp/time
7/22	1	NA	3	5	0	8	---	
7/22	2	375	1	2	2	5	1.3	
7/23	3*	92	3	2	0	5	5.4	13.3C(56F)1000
7/23	4	135	0	0	0	0	0	
7/23	5	273	1	4	0	5	1.8	
7/24	6	184	1	1	1	3	1.6	13.8C(57F)1300
7/24	7	NA	0	0	0	0	---	
7/24	8	184	4	1	0	5	2.7	
7/25	9	265	0	0	0	0	0	15C(59F)1100
7/25	10	166	1	2	0	3	1.8	
7/26	11*	380	0	6	0	6	1.6	15.5C(60F)1030
7/26	12	156	3	1	1	5	3.2	
7/26	13	167	1	1	0	2	1.2	
7/27	14	203	5	2	1	8	3.9	16.1C(61F)1100
7/27	15	NA	0	3	1	4	---	
7/27	16*	160	1	3	1	5	3.1	
7/28	17*	120	1	3	1	5	4.2	
7/28	18*	220	1	1	0	2	0.9	
7/28	19*	231	0	1	0	1	0.4	
7/29	20	NA	0	0	0	0	---	
Totals			26	38	8	72	x = 2.2	

*Two count routes made by one observer.

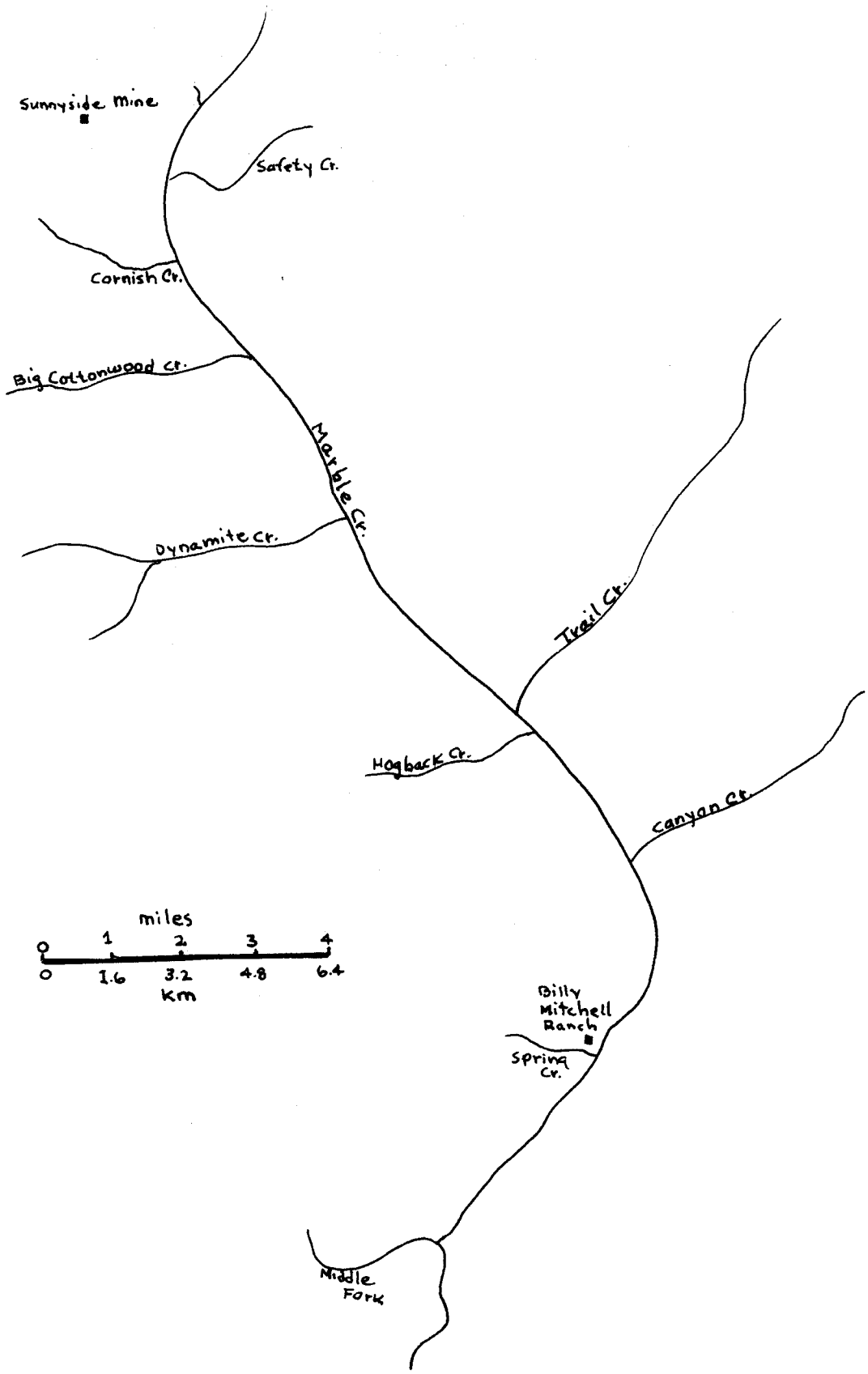


Figure 3. Map of Marble Creek showing tributary streams used as landmarks during survey in August, 1980.

Table 2. Number and species of trout caught in approximately 6.4 km (4 mi) increments down Marble Creek, August 1980.

Date	Location	CT	RB	DV	Percent CT	Percent RB
8/18	to Cornish Cr.	12	7	0	63	37
8/19	to Dynamite Cr.	26	13	0	67	33
8/20	to Trail Cr.	20	18	10	53	47
8/21	to Canyon Cr.	13	7	1	65	35
8/22	to Spring Cr.	14	39	1	26	74
8/23	to mouth	2	14	0	12	88
Total		87	98	12		

Table 3. Length frequencies of 98 rainbow trout caught in Marble Creek, August, 1980.

Length	Frequency	Percent
100-125 mm (4-5 in)	8	8
126-150 mm (5-6 in)	17	17
151-175 mm (6-7 in)	27	28
176-2.00 mm (7-8 in)	25	26
201-225 mm (8-9 in)	8	8
226-250 mm (9-10 in)	6	6
251-275 mm (10-11in)	5	5
276-300 mm (11-12 in)	2	2
Total	98	100

Table 4. Length frequencies of 74 cutthroat trout caught in Marble Creek August, 1980.

Length	Frequency	Percent
100-125 mm (4-5 in)	3	4
126-150 mm (5-6 in)	9	12
151-175 mm (6-7 in)	13	18
176-200 mm (7-8 in)	9	12
201-225 mm (8-9 in)	16	22
226-250 mm (9-10 in)	8	11
251-275 mm (10-11 in)	5	7
276-300 mm (11-12 in)	1	1
301-325 mm (12-13 in)	1	1
326- 350 mm (13-14 in)	5	7
351-375 mm(14-15 in)	3	4
376-400 mm (15-16 in)	1	1
Totals	74	100

Observations and data collected in Marble Creek support that view. The twelve Dolly Varden trout caught ranged in size from 152 to 330 mm (6 to 13 in), and larger Dolly Varden (estimated to 457 mm [18 in]) were seen. Whitefish were also common. Juvenile chinook were observed in most pools between Dynamite and Canyon Creeks with lesser numbers in the lower end of Marble Creek. Most large pools contained at least one adult cutthroat up to 350-400 mm (14-16 in) and/or one or more large Dolly Varden trout. Trail Creek (the largest tributary) appears to be a primary steelhead spawning and nursery area in its lower end. Numerous fry and Age I juvenile steelhead were present in the lower .4 km (.25 mi) surveyed, where gravel riffles, small pools and a meandering gentle gradient exists.

Adult Steel head Tagging

During the fall of 1980, volunteer personnel caught, measured, sexed, jaw tagged and released 11 wild adult steelhead in the main Salmon River below the Middle Fork and 11 wild steelhead in the lower 1.6 km (1 mi) of the Middle Fork itself (Tables 5, 6) (Fig. 4). Three of the tags had been returned by 1 April 1981 (end of season). All were from wild steelhead tagged in the Middle Fork and all were caught 3-4 months later in the main Salmon; 2 below and 1 above the Middle Fork.

Although numbers of fish tagged and recovered tag numbers are small, two important factors are indicated that bear further investigation: 1. Fish tagged in the lower Middle Fork in the fall apparently did not winter-over there; 2. A known 27% of the fish tagged in the lower Middle Fork in the fall were subsequently caught by anglers in the main Salmon River.

The one steelhead (81 cm wild female) caught 19 km (12 mi) above the Middle Fork on 29 March may have been an upriver wild fish that pulled into the lower Middle Fork in the fall, or possibly a Middle Fork fish that wandered up the main Salmon prior to re-entering the Middle Fork.

Radio-equipped hatchery steelhead on the Clearwater River displayed upstream movement past the hatchery as much as 48 km (30 mi) before returning back downstream to enter the ladder (Pettit 1979).

The 11 steelhead tagged in the Middle Fork were classified by length as 55% 1-ocean fish, ≤71 cm (28 in) and 45% as 2-ocean fish (> 71 cm).

We classified the 11 wild steelhead tagged in the main Salmon River below the Middle Fork as 55% 1-ocean fish, ≤71 cm (28 in), and 45% as 2-ocean, >71 cm.

Main Salmon River Sport Fishery

Since the spring of 1974, the harvest of wild Middle Fork steelhead in Idaho has been limited primarily to the sport fishery occurring in the main Salmon River below the Middle Fork. Some fish are caught in the Snake River below the Salmon. Bank angling occurs in the 11-km (7-mi) stretch of roaded river from the Middle Fork to Corn Creek and downriver between Riggins and Whitebird (60 mi). Below the South Fork Salmon, wild stocks returning to that stream also contribute to the fishery.

The largest impact and harvest on Middle Fork stocks occurs in the 128-km (80-mi) unroaded Salmon River canyon from Corn Creek to Vinegar Creek. The fishery is based almost exclusively on outfitter-guided jet boat excursions.

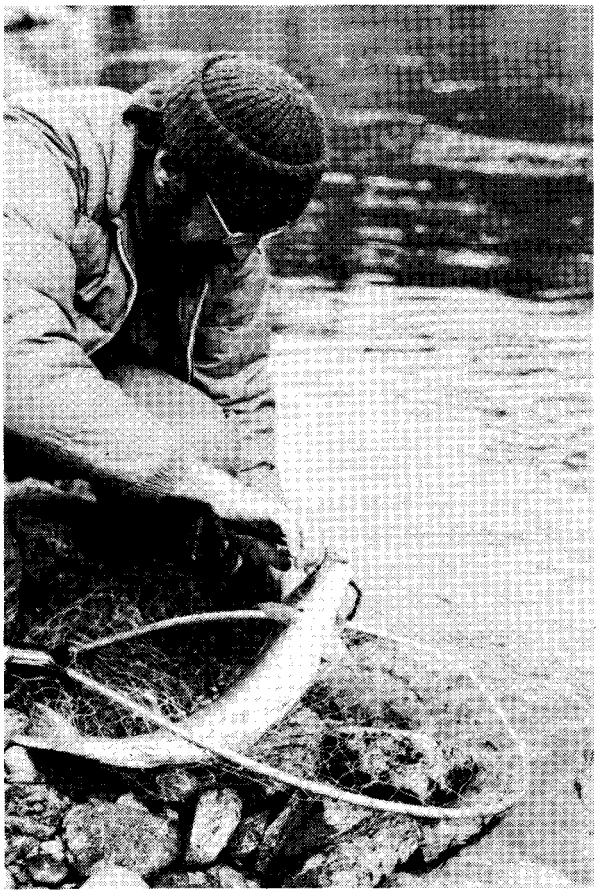


Figure 4. Wild steelhead were jaw tagged in the Middle Fork and main Salmon Rivers, Fall, 1980.

Table 5. Description of wild steelhead tagged in the main Salmon River below the Middle Fork, Fall 1980.

Date	Tag No.	Description	Area	Recovery data
9/29	Z171	M 76cm (30 in)	Devils Tooth	-
9/29	Z177	F 74cm (29 in)	Devils Tooth	-
10/1	Z165	M 61cm (24 in)	Dwyer Creek	-
10/5	Z179	F 66cm (26 in)	Dwyer Creek	-
10/5	Z184	F 66cm (26 in)	Smith Gulch	-
10/12	Z191	F 74cm (29 in)	Lantz Bar	-
10/13	Z168	M 71cm (28 in)	Smith Gulch	-
10/17	Z199	F 56cm (22 in)	Lantz Bar	-
10/24	Z175	F 76cm (30 in)	Bear Creek	-
11/2	C13002	F 56cm (22 in)	Smith Gulch	-
11/16	Z163	M 91cm (36 in)	Nixon Creek	-

Table 6. Description of wild steelhead tagged in the Middle Fork Salmon River, Fall 1980.

Date	Tag No.	Description	Area	Recovery data
11/6	Z193	F 81cm (32 in) M.	Mouth[1/]	Caught 3/29/81 approx. 19 km (12 mi) above Fk.
11/6	Z172	F 66cm (26 in)	Mouth	-
11/6	Z183	F 66 cm (26 in)	Goat Cr. Pool	-
11/6	Z189	F 79cm (31 in)	Goat Cr. Pool	-
11/6	Z158	F 91cm (36 in)	Mouth	-
11/6	Z197	F 60cm (24 in)	Mouth	-
11/6	Z160	F 66cm (26 in)	Mouth	Caught 2/28/81 first hole in main Salmon below M.Fk.
11/6	Z162	F 66cm (26 in)	Mouth	Caught 3/14/81 .8 km (.5 mi) below M. Fk. in Main Salmon
11/15	J22	M 71cm (28 in)	Mouth	-
11/25	NMFS 0905	F 81cm (32 in)	Mouth	-
12/30	J1187	F 94cm (37 in)	Mouth	-

"Mouth area includes from mouth upriver approximately .4 km (.25 mi).

There are presently 11 licensed jet-boat outfitters on this section of the Salmon River operating 17 boats (the total number presently permitted by U.S.F.S. management policy). Private jet boat use is not presently limited, but due to the difficulty of the rapids in this canyon, a relatively small number of these enter the area. During the latter part of the 1970's approximately 25% of the annual Salmon River steelhead harvest has come out of this section (Ortmann 1980).

Estimates of total annual steelhead harvest from the various sections of the Salmon River are drawn via a mail questionnaire survey. The harvest cards anglers must purchase to fish for steelhead are issued on a calendar year basis, and the questionnaire is also issued on a calendar year basis. This results in "split fish-year" data, in which data on the spring season of one year's run and data on the fall season of the following year's run is collected at the same time. This results in a lag-time of approximately a year before a full fish-year run estimate can be drawn. Plans are to modify this system to a fish-year basis in future years to obtain more timely data. In the interim, short-term harvest estimates must be drawn from less accurate means.

The North Fork angler check station has been operated at the same time in the same location and in the same manner since the late 1960's.

The North Fork station has observed an average of 13.6% of the annual Salmon River section 4 (South Fork to Middle Fork) fish-year harvest for the years that data is available (Table 7).

Table 7. Estimated Salmon River section 4 fish-year harvest of steelhead from questionnaire survey, check station count and comparative percent of harvest observed at the North Fork check station 1971-78.

Fish-year	Estimated harvest	North Fork count	Percent observed
71-72	1,826	159	8.7
72-73	1,296	262	20.2
76-77	627	117	18.6
77-78	1,718	205	11.9
Combined	5,467	743	13.6

If applied to the fall 1980-spring 1981 (27 September-29 March) counts (398), an indicated 2,926 steelhead from the 1980-81 fish run were harvested in Salmon River section 4.

Check station data also shows that 75% of the 80-81 harvest occurred in the fall fishery and 25% in the spring fishery. The percent of wild steelhead observed in the catch in section 4 during the fall 1980 fishery was 44%, as defined by inspection of dorsal fins. Wild fish comprised 78% of the spring fishery in section 4 (Appendix II). Using these hatchery-wild fish ratios, and the 75-25 fall-spring harvest ratio, an estimated 965 wild fish were taken in section 4 during the fall fishery and 570 during the spring fishery; 1,535 fish. Two percent of all hatchery fish in the 1980-81 fish run had no dorsal deformities as defined at the Pahsimeroi weir which reduces that number to 1,505 actual wild fish: 945 in the fall and 559 spring.

Based on the percentages of wild and hatchery fish observed in the creel above and below the Middle Fork in the fall of 1980 and spring of 1981, an estimate can be calculated for the percent of wild fish turning up (or stopping below) the Middle Fork, using the following formula:

$$X = \frac{(W)\ (N) - W_1 \left[\frac{(N)\ (H)}{H_1}\right]}{(W)\ (N)} \times 100$$

Where:

X = percent steelhead turning up Middle Fork

H = percent* hatchery steelhead below Middle Fork

H_1 = percent hatchery steelhead above Middle Fork

W = percent wild steelhead below Middle Fork

W_1 = percent wild steelhead above Middle Fork

N = 100 (or any number representing total population of steelhead below Middle Fork)

*Percent figure, not decimal.

During the fall of 1980, wild fish comprised 44% of the harvest below the Middle Fork in section 4 and 17% of the harvest above the Middle Fork (section 5). Applying the formula to these percentages indicates that of the wild steelhead in section 4, 74% were destined for the Middle Fork (if all wild fish were destined for the Middle Fork the wild harvest in section 5 would be zero). This indicates that of the estimated 945 wild fish caught in section 4 during the fall 1980 fishery, 74% or 699 were Middle Fork fish.

Applying the same procedure to the spring 1981 fishery, using the 78%-14% wild ratio below and above the Middle Fork, an estimated 95% of the 559 wild fish caught during the spring fishery, or 531 fish, were destined for the Middle Fork. This leaves a final estimate of 1,230 wild Middle Fork stock steel head harvested in section 4 during the fall 1980-spring 1981 steelhead fishery.

Steelhead destined for the Middle Fork Salmon are also harvested in the Salmon River in sections 1, 2 and 3, below the South Fork Salmon. Data from these sections are limited. A check station operated near Riggins recorded fish for Salmon River section 3 (Little Salmon River to South Fork) in the fall of 1980 and showed a 50:50 hatchery to wild fish ratio. Assuming only minimal steelhead turnoff into tributaries below that point (only the Little Salmon River is of any consequence) the section 3 fall ratio of 50% wild versus the section 4 fall ratio of 44% wild indicates that 22% of the wild run entering Salmon River section 3 was destined for the South Fork.

The questionnaire harvest estimates for the 1971-72, 1972-73, 1976-77 and 1977-73 steelhead runs show an average of 47% of the entire Salmon River harvest occurred in sections 1, 2 and 3 combined. Using this 47% figure, deducting hatchery harvest estimates (50%) and estimates of the South Fork wild fish contribution of 22%, and an upriver wild component of 26%, an estimated 1,804 Middle Fork stock steelhead were harvested in sections 1, 2 and 3 during the 1980-81 fish run.

The total estimated harvest then, of wild Middle Fork stock steelhead from the mouth of the Salmon River to the Middle Fork during the fall 1980-spring 1981 sport fishery is 3,034 fish.

While there is presently no way to estimate the total escapement into the Middle Fork to draw an estimate of rate of exploitation, a rough parallel can be drawn by inspecting the data on hatchery fish. The 1979-80 exploitation rate on the Pahsimeroi steelhead run was estimated at 66% (Reingold 1981). Of the total 79-80 harvest, an estimated 60% (Ortmann 1980) occurred below the Middle Fork. This translates into an exploitation rate of 40% from the Middle Fork to the mouth of the Salmon for hatchery steelhead returning to the Pahsimeroi. This could be indicative of the exploitation rate on wild stocks in this same area.

There are some basic assumptions and considerations that need to be taken into account when attempting to draw estimates of harvest of mixed steelhead stocks migrating up a major river such as the Salmon. Some of these are:

Stocks destined for the South Fork Salmon do not proceed beyond that point in the main Salmon to any significant degree.

Stocks destined for the Middle Fork Salmon do not proceed beyond that point in the main Salmon to any significant degree.

Upriver hatchery stocks migrating upstream past the Middle Fork and South Fork in the main Salmon will alter the wild:hatchery harvest ratios over time below those points.

Steelhead runs entering smaller tributaries of the main Salmon are unknown factors.

In the light of the constraints and wide range of calculations inherent in the estimates presented, they should be viewed only as an indication of the possible impact of the Idaho angling harvest on the wild steelhead stocks destined for the Middle Fork Salmon. The level of harvest appears to be substantial and coupled with the high downstream migrant mortalities and other downriver fisheries it may be increasingly difficult or impossible for these stocks to maintain themselves through natural reproduction.

Table 8. Length frequencies of wild steelhead trout caught in section 4 (South Fork to Middle Fork) of the main Salmon River, fall 1980-spring 1981.

Total (cm)	Length (in)	Number measured
55.9	22	6
58.4	23	14
60.1	24	23
63.5	25	26
66.0	26	30
68.6	27	30
71.1	28	17
73.7	29	17
76.2	30	23
78.7	31	24
81.3	32	32
83.8	33	18
86.4	34	19
88.9	35	14
91.4	36	9
94.0	37	8
96.5	38	1
99.0	39	0
101.6	40	1
	Total	312

As more accurate harvest estimates become available with the return of harvest questionnaire data in 1981 and 1982, we can revise and update harvest figures and exploitation rates.

Adult Steelhead Length Frequencies

Length frequencies of 312 wild steelhead caught in section 4 during the 1980-81 season are shown in Table 8. Length frequency records from check stations, field observations, fish traps, etc. over many years, indicate that both A-strain and B-strain wild steelhead exist in the Salmon River system. Length range for 1- and 2-ocean fish from these two groups is different, with B-strain fish averaging larger for the same age (Pettit 1978). Work done at both the Pahsimeroi and Dworshak fish hatcheries for the past several years show that the 1-ocean/2-ocean A-strain size break averages approximately 66-68 cm (26-27 in), and the size break for 1- and 2-ocean B-strain steelhead occurs approximately at 71-74 cm (28-29 in). Some overlap of 1- and 2-ocean fish of both strains occurs at those points.

Our length frequencies from the Salmon River wild stocks do not demonstrate the 66-68 cm (26-27 in) 1-2-ocean size break expected for A-strain fish. It strongly demonstrates the 71-74 cm (28-29 in) B-strain 1-2-ocean division.

DISCUSSION

The lower ends of the tributaries of the Middle Fork may be key areas for summer rearing of juvenile steelhead trout and cutthroat nursery areas appear to be concentrated in the upper ends of these streams.

Two out of eleven steelhead tagged in the lower Middle Fork in the fall of 1980 were caught in the main Salmon just below the Middle Fork as much as 4 months later and this points to a possible problem. Concern has been expressed that Middle Fork stock fish may be extremely vulnerable to harvest in the area just below the confluence with the main Salmon River in early spring. More tagging in the lower Middle Fork needs to be done.

The long-standing problem of differential harvest of mixed stocks is vividly displayed in the Salmon River steelhead sport fishery. While hatchery stocks returning to the rack may be able to withstand high harvest rates, perhaps as much as 80% or more, wild stocks reproducing naturally cannot. The indication of a possible 40% exploitation rate on the Middle Fork steelhead run is indicative of the growing participation and efficiency of steelhead sport angling. The impact on wild fish by increased numbers of anglers drawn to large hatchery returns must be considered **in** future management plans. It is possible that wild stocks may need to be assisted in some manner if they are to exist concurrently with large hatchery runs. Information collected on this project over the next few years may help provide answers to preserving what is one of the best wild steelhead runs in Idaho.

LITERATURE CITED

Gebhards, S.V. 1959. Columbia River Fisheries Development Program. Planning Report. Idaho Department of Fish and Game Report.

Lindland, R.L. 1959. Selway River Fisheries Investigations. Job Completion Report. Idaho Department of Fish and Game.

Mallet, J.L. 1963. The Life History and Seasonal Movements of Cutthroat Trout in the Salmon River, Idaho. Thesis, University of Idaho.

Ortmann, D.W. 1980. Annual Survey of the Salmon and Steel head Sport Fishery Harvest in Idaho. Study I - 1980. Job Performance Report. Idaho Department of Fish and Game.

Pettit, S.W. 1978. Clearwater River Steelhead Investigations. Job VIII. Job Performance Report. Idaho Department of Fish and Game.

Reingold, M. 1981. Evaluation of Transplanting Snake River Steelhead Trout to the Pahsimeroi River, 1980. Progress Report. Idaho Department of Fish and Game.

APPENDICES

APPENDIX I

Description of main stem Middle Fork snorkel transects. Photos on file at Idaho Fish and Game, Salmon Subregional Office.

Transect 1: Along left and right banks from large house rock (on left bank to end of riffle above Boundary Creek. (no photos)

Transect 2: Below Ramshorn Creek ± 1/8 mile beginning at Talus slope on left bank to beginning of turn in river below. Counts made along left bank. (photos 2A, 2B, 2C) (375 m)

Transect 3: At lower Elkhorn Camp start at slackwater to first left turn. Counts along left and right banks. (photo 3) (92 m)

Transect 4: Riffle parallel to Sheepeater Hot Springs Camp along left side only. (photos 4A, 4B) (135 m)

Transect 5: Run at foot of rapids just below Rapid River. From foot of pool to shallows at end of run. Left and right side counted. (no photos) (273 m)

Transect 6: Pool-run just below Indian Creek beach. Left and center counted. (photos 6A, 6B) (184 m)

Transect 7: Run two turns below Marble Creek. (Can see Marble Creek bridge from start.) Head of run to lone tree on left, before cliff. Center and right bank counted. (photo 7)

Transect 8: From bottom of first river bend above Hood Ranch to old bridge abutments. Left side and center counted. (no photo) (184 m)

Transect 9: Across from Cougar Ranch Cabin downstream to first lone pine tree on left bank. Pocket water behind rocks. Left and center counted. (photo 9) (265 m)

Transect 10: From big boulder at bottom of twin channels below Whitney Cox Camp downstream to twin rocks approximately 200 yds. Look behind big rocks in center and along cliff. (photos 10A, 10B) (166 m)

Transect 11: Below Hospital Bar around right hand bend. From large snag on left bank down to leaning tree. Left and center counted. (photo 11) (380 m)

Transect 12: First run below Tappen Falls pool, on right and center to lower cliffs. (photo 12) (156 m)

Transect 13: Below first right bend downstream from Camas Creek (+ ¼ mile), (cliff on right). From large rocks on left bank (below cliff) to house rock on left. Left and center counted. (photo 14A, 14B) (167 m)

Transect 14: First left turn below Flying B Ranch, along right bank between choppy water. End at large bush on right bank. Center and right counted. (photo 14A, 14B) (203 m)

Transect 15: Run along Driftwood Camp from big rock near left cliff to beach landing behind large rock on right bank. Look behind rocks. Center and right side counted. (photo 15)

Transect 16: Along right shore across from Survey Camp (cliff area) to big rocks at head of big pool. Counted right side only. (no photo) (160 m)

Transect 17: Along left shore after first whitewater below Elk Bar (cliff along right bank). From spring cave on left wall to lone pine tree on left bank. Left and center counted. (photo 17) (120 m)

Transect 18: Left bank in straight stretch below Ship Island Creek. From large rock on left bank to white rock on left bank. Left and center surveyed. (photo 18) (220 m)

Transect 19: Left bank above Little Ouzel. From rock shelf on left, around point to lower end of second cove across from lone pine on opposite (right) bank. Left and center surveyed. (photo 19) (231 m)

Transect 20: Parallel to Goat Creek beach. Begin at whitewater end at rocky point just below Goat Creek. Right and center surveyed. (photo 20)

APPENDIX II

Summary of wild steelhead ratio data collected at the North Fork check station, Shorts Bar and from jet boat interviews on the Salmon River, fall 1980 and spring 1981.

Salmon River section	Number of fish observed	Percent wild fish	Season
3	238	50	
4	298	44	fall '80
5	657	17	
4	152	78	
5	228	14	spring '81

APPENDIX III

Length frequencies of juvenile steelhead - rainbow trout caught by angling on the Middle Fork Salmon River, August 1980.

LENGTH	FREQUENCY
100-109 mm	1
110-119 mm	1
120-129 mm	6
130-139 mm	3
140-149 mm	6
150-159 mm	10
160-169 mm	28
170-179 mm	10
180-189 mm	11
190-199 mm	22
200-209 mm	7
210-219 mm	8
220-229 mm	4
230-239 mm	4
240-249 mm	5
250-259 mm	6
260-269 mm	7
270-279 mm	5
280-289 mm	1
290-300 mm	0
Total	145

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